Inquiry Lesson Plan

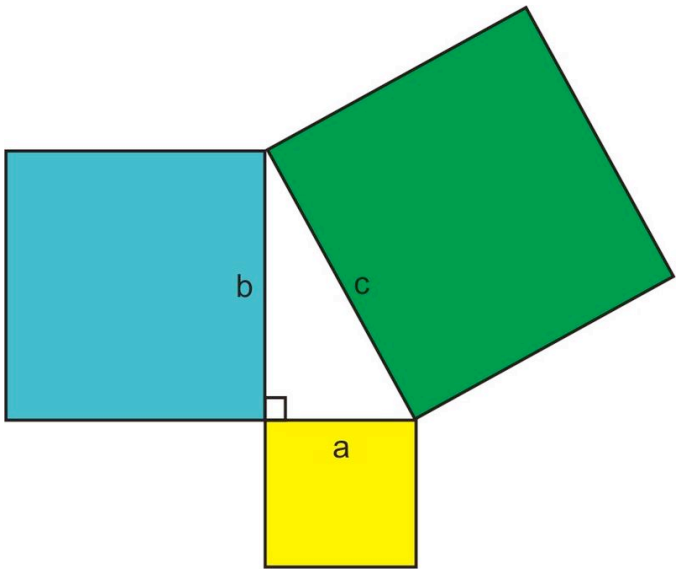
Grade/Content Area	Grade 8 / Mathematics : Geometry
Lesson Title	*Pythagorean Theorem- Prove it!*
Common Core Standards	CCSS.Math.Content.8.G.B.6 Explain a proof of the Pythagorean Theorem and its converse. CCSS.Math.Content.8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
Context of the Lesson *Where does this lesson fit in the curriculum and instructional context? Is it the opening of a unit or a series of lessons?*	This is an introductory lesson on the Pythagorean theorem. It will be the first in a series of several lessons in which students will deduce the Pythagorean theorem through an exploratory activity. The students will then practice this theorem as well as its converse, and apply this knowledge to real life situations.
Opportunities to Learn *Differentiation: Materials, Learners and Environments*	**Plans to differentiate instruction:** I differentiated instruction in several different ways. This is a very visual demonstration of the proof behind the Pythagorean theorem, and will appear to the visual learners in the class. It will also play to the strengths of those who work well in groups and can interact effectively with their peers. The chart provided will help students who may struggle with the material. This will make it easier for them to focus on the material without getting caught up creating a chart correctly. There will be several different products assessed at the end of this activity. There will be written work, math computations, as well as verbal communication. This will allow students with a variety of strengths to demonstrate that they understand the material. **Accommodations and modifications:** Based on the need of the students, they can be allowed to use a calculator for computations. The chart provided will also help to organize the data and highlight the important aspects that I am looking for and that the students need to focus on. **Environment factors:**

	The students will be heterogeneously grouped into four sections. I will plan out these groups to mix students at different levels so that they can help one another learn from each other. The structure of the room should allow for flexible grouping, so that students can have a chance to work with a variety of classmates, and encourage active student participation and interaction. **Materials:** 1) Interactive Applet http://www.shodor.org/interactivate/activities/SquaringTheTriangle/ 2) Handout • Chart • Geometric proof of Pythagorean theorem
Objectives	1. Students will be able to collect and organize data. 2. Students will be able to establish a conjecture about the relationship between the areas of the three squares. 3. Students will be able to deduce the Pythagorean theorem through exploration.
Instructional Procedures	**LAUNCH:** We will begin the class with a review of some of the key vocabulary that we will need throughout this lesson. *What is a right triangle? What are the legs of a right triangle? The hypotenuse?* The students will need to access prior knowledge in order to make use of these terms and concepts in the upcoming lesson. After this short discussion, we will begin with an introduction of the activity. We will begin by drawing a line on a grid, and determining how to find the length. *Now, what happens when we connect three lines to construct a right triangle on a grid? Can we find the length of the legs? How about the hypotenuse?* Allow students to discuss the possibilities for several minutes, guiding them to the problem: How do you find the length of the hypotenuse of a right triangle? We will try to solve this problem by turning each side of a right triangle into a square. The class will be split up into four groups to work with an interactive online activity. This applet will allow them to see the changes in the area of the squares when they change the length of

	the two legs of the right triangle. Each group will choose different lengths of the two legs, find the area of the three squares, and input all this information into a chart. *Do any patterns emerge? What is the relationship between the areas of these three squares?* Students will be prepared to share what they learn with the class, and explain how they came to this conclusion. **EXPLORE:** The students will be grouped into four stations set up throughout the classroom, where each group will have access to this applet. During this time, I will circulate the room to help scaffold this activity. While this is a student-centered activity, it is still very structured. The students will have certain information to collect and organize, and from this, they will be able to extrapolate the Pythagorean theorem. My main duties will be to probe the students' thinking and guide them in the right direction. I will be listening to group discussions and inquiring about their process. Do they remember the correct formula for finding the area of a square? Are they able to calculate square roots correctly? These are all basic skills they will need to apply during this exploration, and I will be checking for these as I circulate the class. I will also be facilitating them in finding a pattern and relationship in the areas of the squares. If one person in the group is having trouble and cannot see the relationship, have one of his/her peers explain it to them before stepping in if need be. Perhaps the most difficult aspect of this activity is stepping back and deducting the general theorem out of this table of data. We will rejoin as a whole group for this discussion so that I can facilitate. **SUMMARIZE/SHARE :** Once we rejoin as a whole group, I will ask the groups to share what they found. *What was the relationship between the areas of the three squares?* Allow for some discussion among the students and have them all come to an agreement. Now we can try to make this a more general statement. *Now that we know [area of a] + [area of b] = [area of c] is there a different way we can represent this using symbols?* If students are having trouble with this, I will give them a hint by rephrasing the

	question and breaking it down; *what is area of a square with length a? The area of a square with length b? And of a square with length c?* Now we will have our formula $a^2 + b^2 = c^2$ *How can we find the length of c of a right triangle given that we know the area?* With this, we answered our original question, and found the length of the hypotenuse of a right triangle. If we have time, we can go through some examples together as a class. When given the lengths of two legs of a right triangle, we will go through the steps to find the length of the hypotenuse.
Assessment	Launch: During this portion of the class, the students will be assessed informally on their ability to recall prior knowledge and apply it to this activity. I will be looking for participation and attentiveness in all students, and preparation for the upcoming activity. I will be able to gauge whether or not students have the necessary background knowledge needed for this activity. Explore: It is during this portion of class when the formal assessments will be collected. Students will be evaluated based on their ability to collect the data necessary without making computational errors. This is also when I will read their written work to assess if they were able to make accurate conjectures based on their data, and express it accurately in writing. I will also be assessing them on their ability to work collaboratively in a group. Summarize/Share: Here students will again be assessed informally. This is when all the ideas come together and when most of the learning will take place. It is important that all students are actively participating in the class discussion and are involved in using all the data we collected to deduce the Pythagorean theorem.
Reflections *This section to be completed only if lesson plan is implemented.*	**Student Work Sample 1 – Approaching Proficiency:** **Student Work Sample 2 – Proficient:** **Student Work Sample 3 – Exceeds Proficiency:** **Lesson Implementation:**

Name: _____ Date: _____



Length of a	Length of b	Area of a	Area of b	Area of c	Length of c

Do you notice any patterns? What is the relationship between the areas of these three squares?